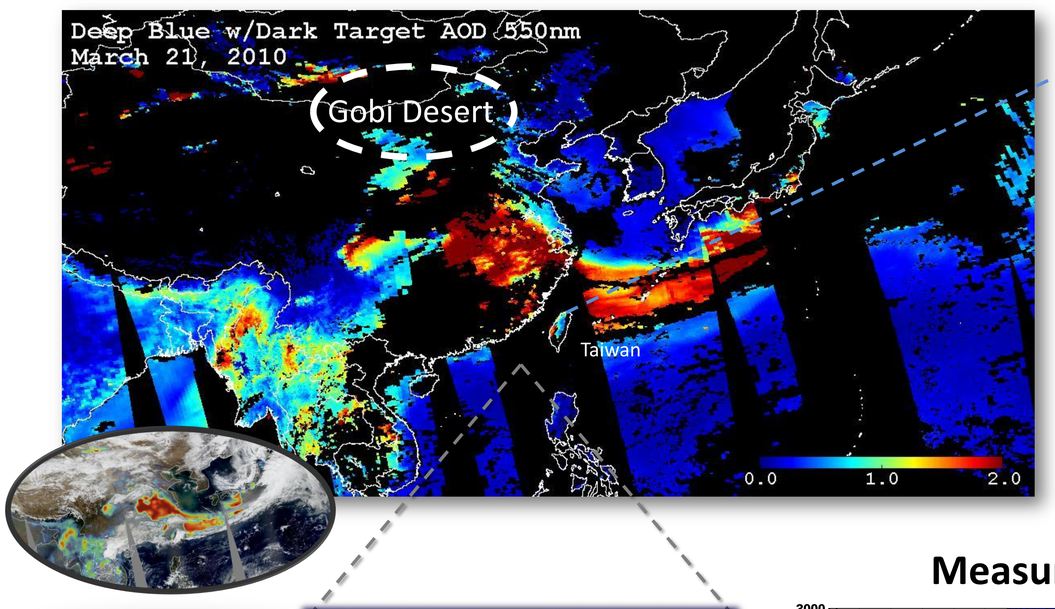
# Deployment of NASA/GSFC SMART-COMMIT Mobile Observatory: Measuring an Asian super dust storm in 2010!!

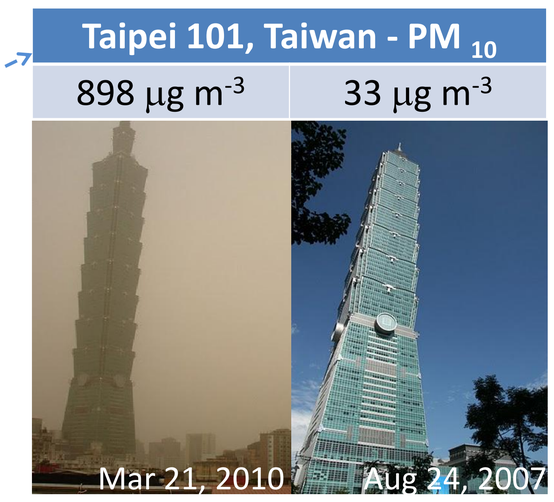
*Science, Education, Outreach and beyond*


**Si-Chee Tsay[1] and N.-H. George Lin[2] (PIs)**
**S.-H. Carlo Wang[2,3,1], Shaun W. Bell[4,1], Can Li[3,1], Q. Jack Ji[3,1], Richard A. Hansell[3,1], Ferret Kuo[5], Eric Chia[5], Jense Chiu[2], Clare E. Salustro[4,1], N. Christina Hsu[1], Brent N. Holben[1], E. Judd Welton[1], Y.-C. Chu[6]**

[1]Goddard Space Flight Center, NASA, Greenbelt, Maryland, USA; [2]Department of Atmospheric Sciences, National Central University, Chung-Li, Taiwan; [3]University of Maryland, College Park, Maryland, USA; [4]Science Systems and Applications Inc. (SSAI), Lanham, Maryland, USA; [5] Weatherrisk Inc., Taipei, Taiwan; [6]Taiwan EPA, Taipei, Taiwan


**The NASA/GSFC SMART-COMMIT** (**S**urface-sensing **M**easurements for **A**tmospheric **R**adiative **T**ransfer **- C**hemical, **O**ptical, and **M**icrophysical **M**easurement of **I**n-situ **T**roposphere) is currently deployed at Dongsha Island, Taiwan for investigating the evolution of regional atmospheric pollutants (e.g., dust, anthropogenic, and biomass-burning aerosols) and their interactions with cloud and precipitation during the period of March-June 2010. The deployment is a pilot experiment for the upcoming 7-SEAS (7 South East Asian Studies) project involving a collaboration between NASA, US-Navy, and many regional agencies. On March 21st, 2010, a super dust storm spanning from the Gobi Desert to the W. Pacific was measured by our observatory. Beyond scientific studies, we also collaborate with local scientists, and train on-site technicians to help establish Dongsha as an atmospheric/oceanic supersite.



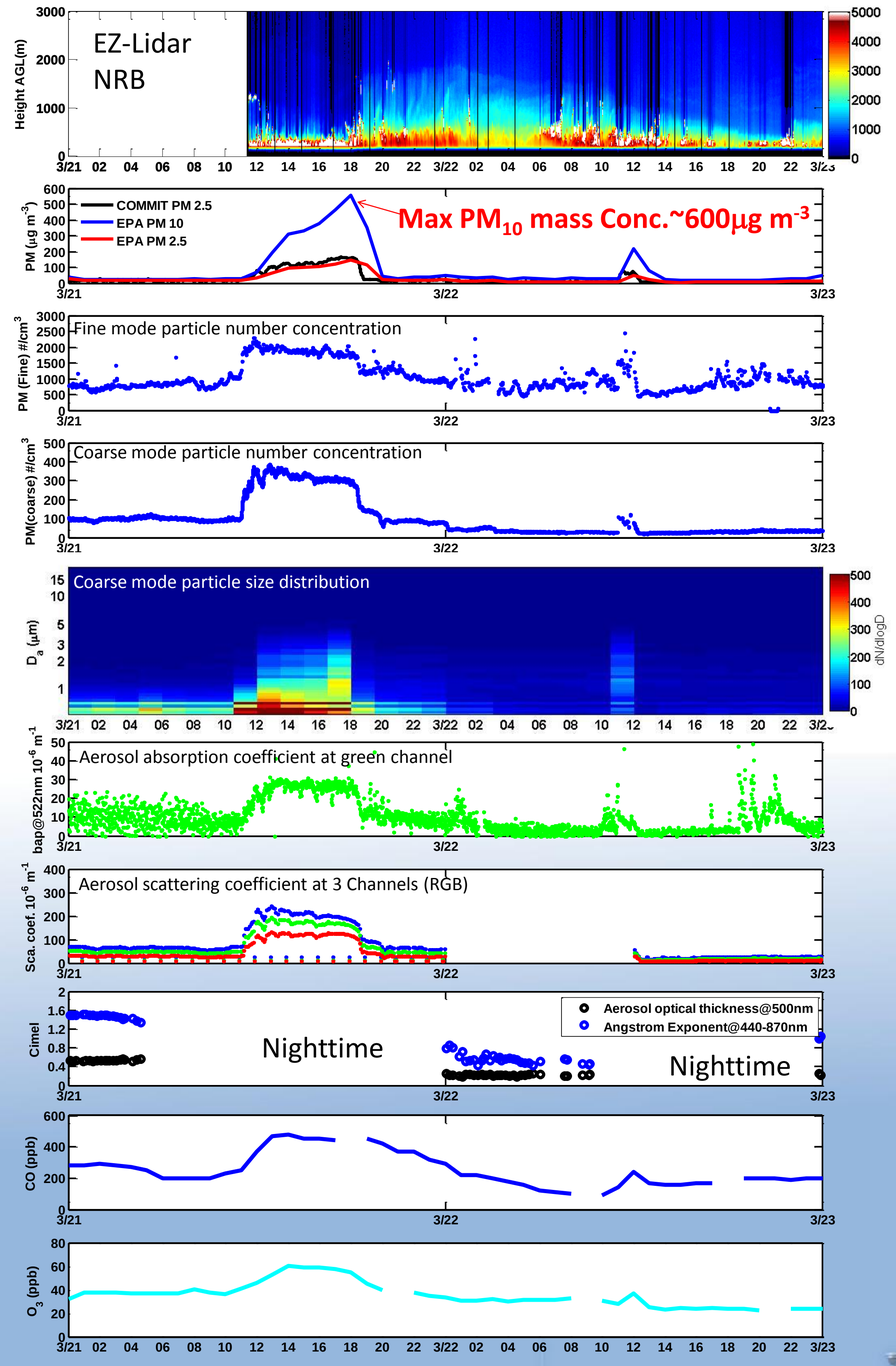

## Outbreak of Asian Dust Storms

**Taiwan, located downwind of dust storm outbreaks from China, in the sink region of biomass-burning aerosols from Southeast Asia, and at the outflow of urban-industrial pollutants from the Pearl and Yangtze River Delta, is exposed to a seasonal milieu of natural and anthropogenic aerosols in the atmosphere. In the springtime, outbreaks of Asian dust storms occur frequently in the arid and semiarid areas of northwestern China — about $1.6\times10^6$ km$^2$, including the Gobi and Taklimakan deserts — with continuous expansion of spatial coverage. These airborne dust particles, originating in desert areas far from polluted regions, interact with anthropogenic sulfate and soot aerosols emitted from Chinese megacities during their transport. Adding the intricate effects of clouds and marine aerosols, dust particles reaching the marine environment can have drastically different properties than those from their sources.** (*c.f.*, Tsay, S. C., 2009: Outbreaks of Asian Dust Storms: An Overview from Satellite and Surface Perspectives. *Recent Progress in Atmospheric Sciences: Applications to the Asia-Pacific Region*, *World Scientific Publishing*, 700 pp.)


## Dongsha Atoll Profile

**Dongsha atoll (Marine National Park; http://dongsha.cpami.gov.tw) is composed of a saline lake of ~ 500 km$^2$ , and Dongsha Island. Home to numerous marine creatures, the atoll is renowned for its rich biological resources and beautiful coral reef landscape.**

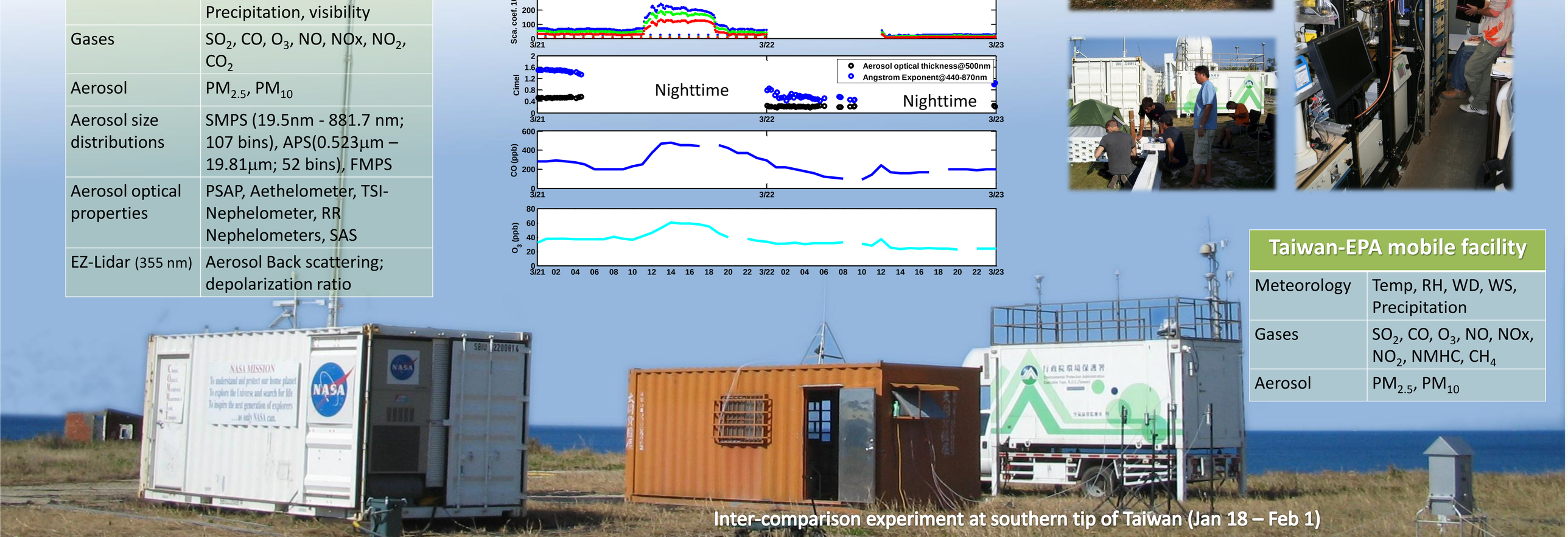
## Measurements at Dongsha




Current setup at Dongsha

| NASA/GSFC COMMIT observatory | |
|---|---|
| Meteorology | Temp, Press, RH, WD, WS, Precipitation, visibility |
| Gases | $SO_2$, CO, $O_3$, NO, NOx, $NO_2$, $CO_2$ |
| Aerosol | $PM_{2.5}$, $PM_{10}$ |
| Aerosol size distributions | SMPS (19.5nm - 881.7 nm; 107 bins), APS(0.523μm – 19.81μm; 52 bins), FMPS |
| Aerosol optical properties | PSAP, Aethelometer, TSI-Nephelometer, RR Nephelometers, SAS |
| EZ-Lidar (355 nm) | Aerosol Back scattering; depolarization ratio |

| Taiwan-EPA mobile facility | |
|---|---|
| Meteorology | Temp, RH, WD, WS, Precipitation |
| Gases | $SO_2$, CO, $O_3$, NO, NOx, $NO_2$, NMHC, $CH_4$ |
| Aerosol | $PM_{2.5}$, $PM_{10}$ |




Inter-comparison experiment at southern tip of Taiwan (Jan 18 – Feb 1)